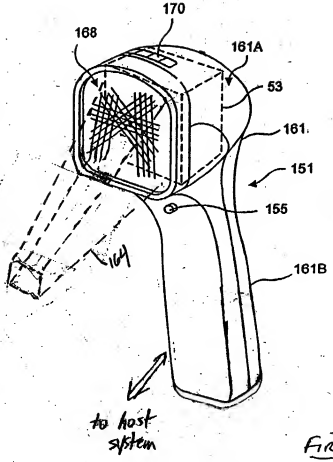


First Generalized Embodiment

FIG. 1A

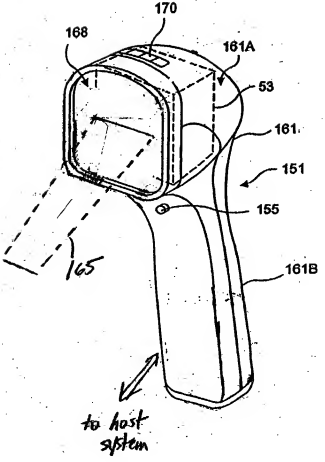
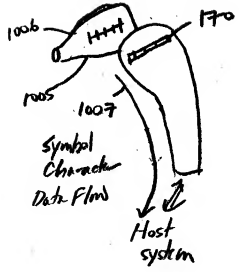


FIG 1B



OMNI-DIRECTIONAL Mode

FIG. 2A

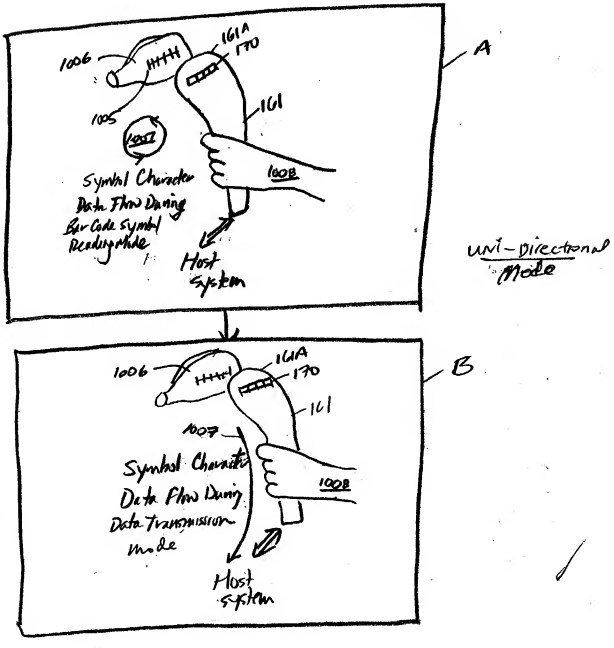

A
1006
161A
170
161
1005
1007
Symbol Character Data Flow During Bar Code Symbol Reading Mode
1008
Host System
Uni-Directional Mode
B
1006
161A
170
161
1007
Symbol Character Data Flow During Data Transmission Mode
1008
Host System

FIG. 2B

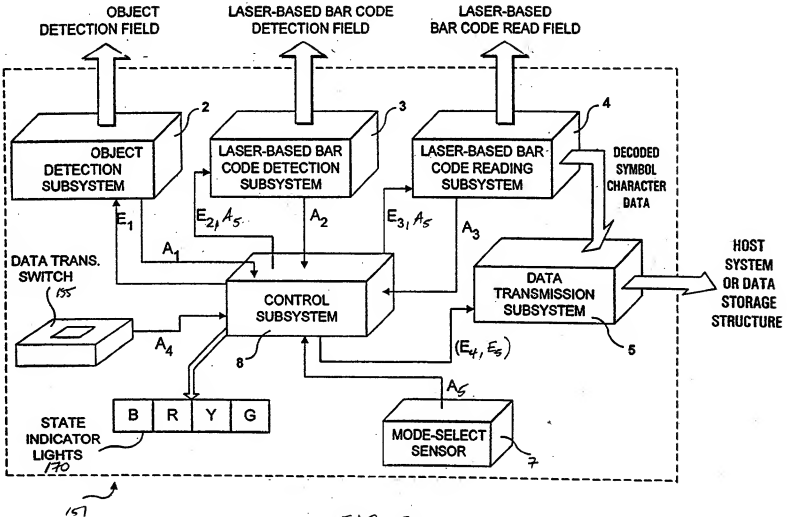


FIG. 3

5/17

10042755 . 111302

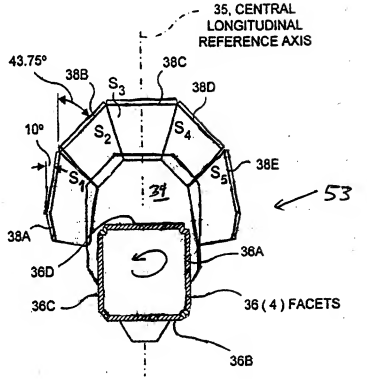
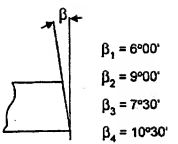


FIG. 4A

	TWIST α	BEND θ
$S_{1\text{-}5}$	10°	46.0°
$S_{2\text{-}4}$	43.75°	42.5°
S_3	90°	40.5°

FIG. 5B



β_1 = 6°00'
β_2 = 9°00'
β_3 = 7°30'
β_4 = 10°30'

FIG. 5A

6/12

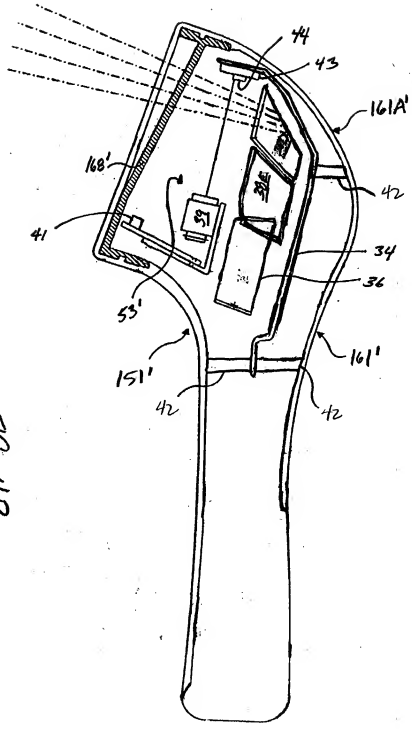


Fig. 43

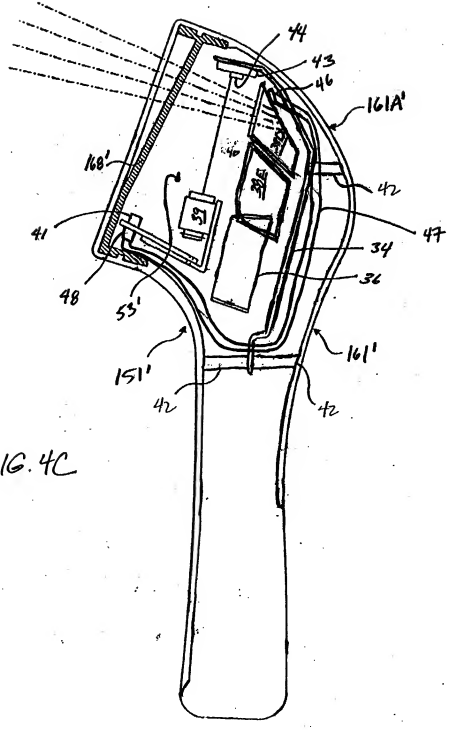


FIG. 4C

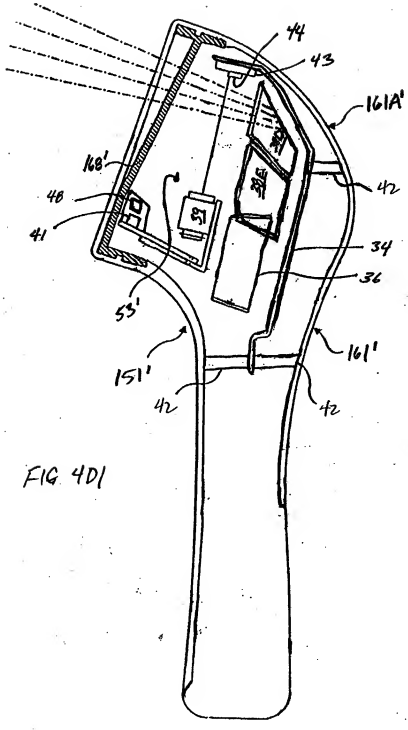


FIG 4D1

35, CENTRAL LONGITUDINAL REFERENCE AXIS
38C
38D
38E
53'
36A
36 (4) FACETS
36B
41
48
36D
36C
Position Sensor Retrieval Pulse
ST
S_1
S_2
S_3
S_4

FIG. 4D2

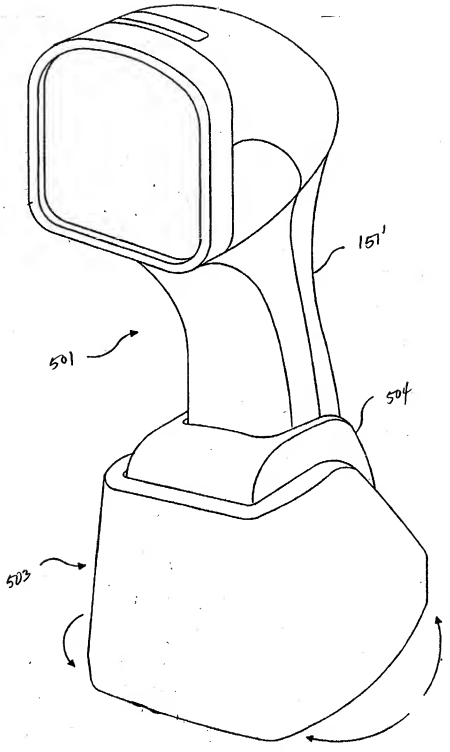


FIG. 5A

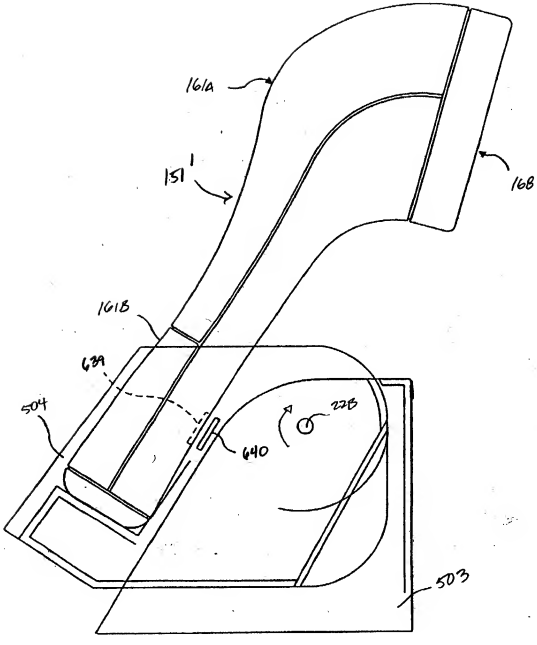


FIG. 5B

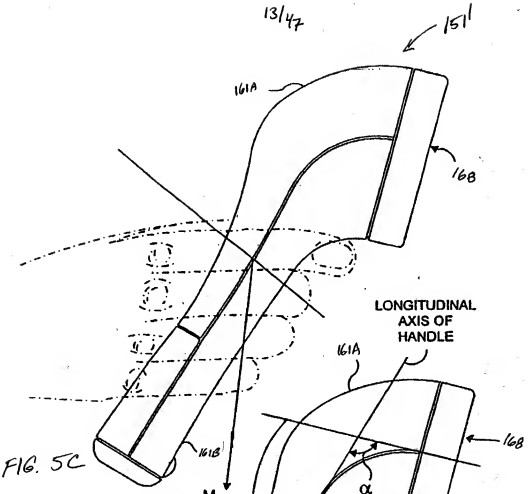
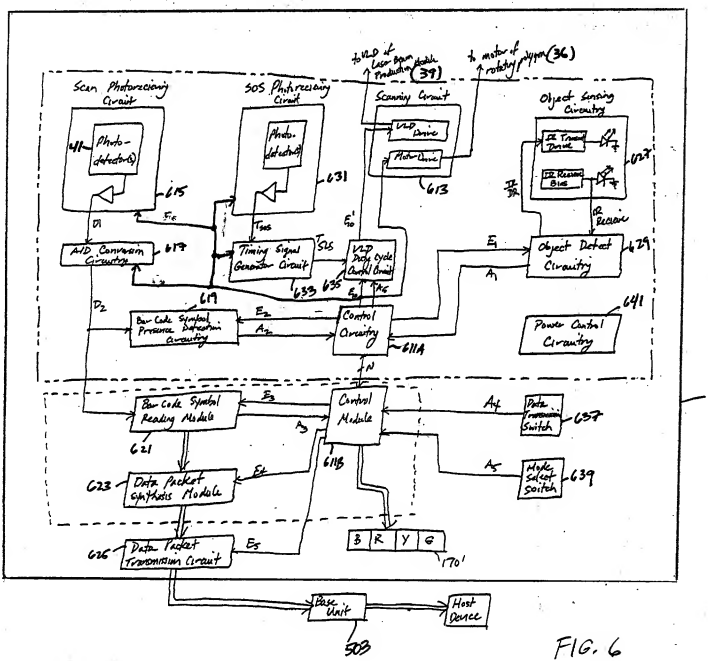

151'
161A
168
LONGITUDINAL AXIS OF HANDLE
161A
168
161B
M_C
α
AXIS OF HEAD SECTION; PARALLEL TO SCAN VOLUME PROJECTION AXIS
151'
161B

FIG. 5C

FIG. 5D


Scan Photoreceiving Circuit
SOS Photoreceiving Circuit
Scanning Circuit
Object Sensing Circuitry
Photo-detector(s)
Photo-detector
VCO Driver
Motor Driver
IR Transmit Diode
IR Receive Diode
A/D Conversion Circuitry
Timing Signal Generator Circuit
VCO Duty Cycle Control Circuit
Object Detect Circuitry
Bar Code Symbol Presence Detection Circuitry
Control Circuitry
Power Control Circuitry
Bar Code Symbol Reading Module
Control Module
Data Transmit Switch
Data Packet Synthesis Module
Mode Select Switch
Data Packet Transmission Circuit
B
R
Y
G
Base Unit
Host Device
to VCO of Laser Beam Production Module (39)
to motor of rotating flipper (36)
151'
503
FIG. 6

10042755.111302

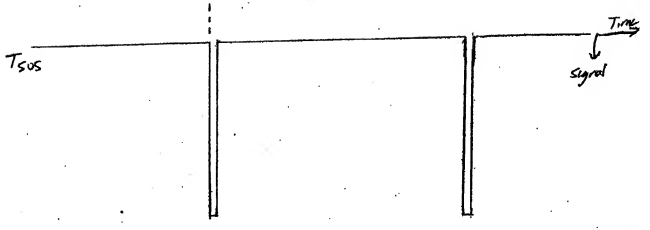


FIG. 7A

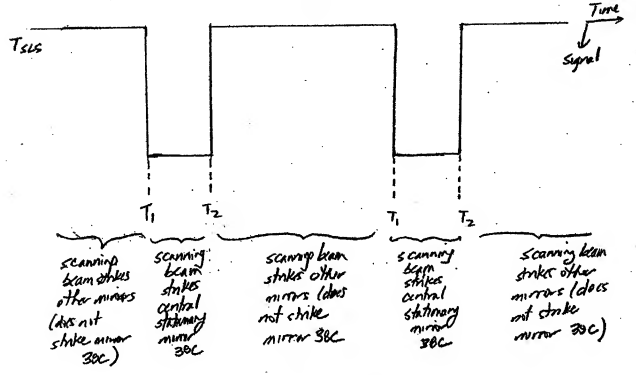


FIG. 7B

$$E_{10}' = (\overline{T_{SLS}} \cdot E_{10} \cdot A_5) + (E_{10} \cdot \overline{A_C})$$

FIG. 7C

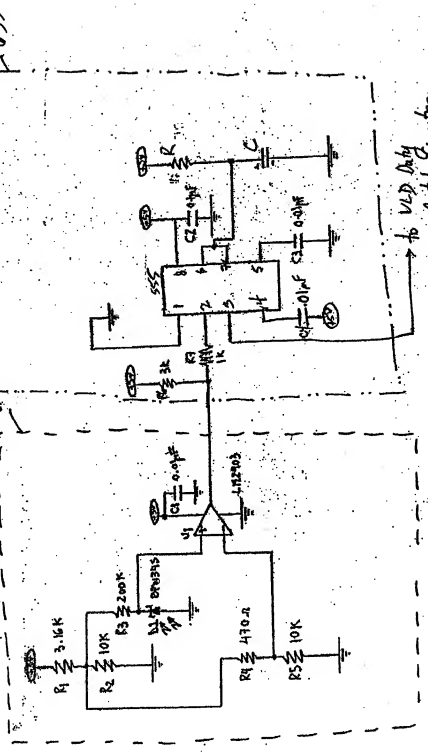

633
631
R1 3.16K
R2 10K
R3 200K
R4 470Ω
R5 10K
R6 3K
R7 1K
C1 0.01μF
C2 470pF
C3 0.01μF
C4 0.01μF
U1 LM2903
555
To VLD Duty Control Circuitry 635

FIG. 7D

Mode Select	Tsis	Q1	Q2	R_{EFF}	Purpose
Open	H	on	off	~5120Ω	Load.
Open	L	off	on	~R	Normal
Closed	X	off	on	~R	Normal

FIG. 7E

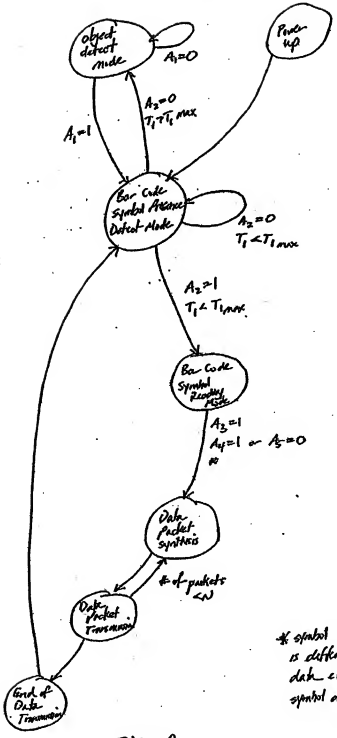

object detect mode
Power up
$A_1=0$
$A_2=0$
$T_1 \geq T_{1\,max}$
$A_1=1$
Bar Code Symbol Absence Detect Mode
$A_2=0$
$T_1 < T_{1\,max}$
$A_2=1$
$T_1 < T_{1\,max}$
Bar Code Symbol Reading Mode
$A_2=1$
$A_1=1$ or $A_2=0$
#
Data Packet Synthesis
# of packets < N
Data Packet Transmission
End of Data Transmission
* symbol character data is different than data element in decoded symbol data buffer

FIG. 8

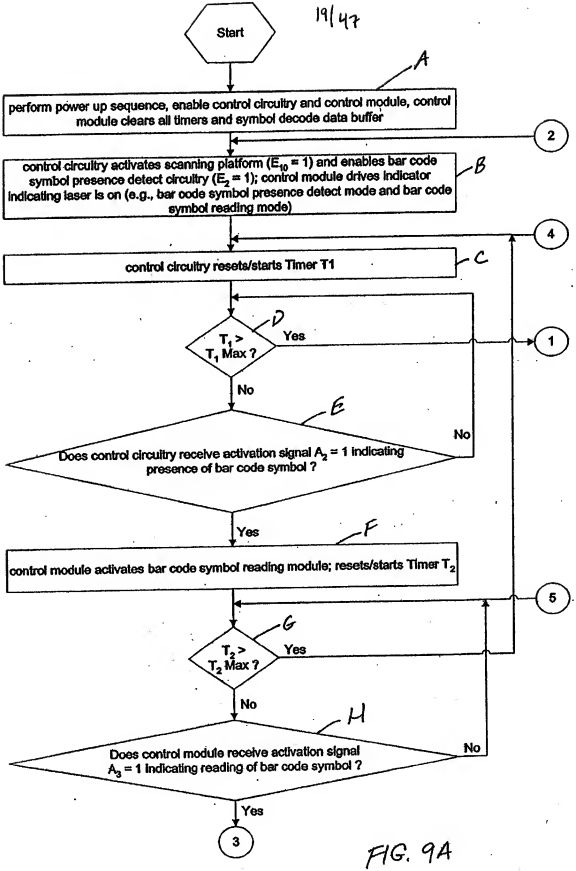

Start
A
perform power up sequence, enable control circuitry and control module, control module clears all timers and symbol decode data buffer
2
control circuitry activates scanning platform (E_{10} = 1) and enables bar code symbol presence detect circuitry (E_5 = 1); control module drives indicator indicating laser is on (e.g., bar code symbol presence detect mode and bar code symbol reading mode)
B
4
control circuitry resets/starts Timer T1
C
D
T_1 > T_1 Max ?
Yes
1
No
E
Does control circuitry receive activation signal A_2 = 1 indicating presence of bar code symbol ?
No
Yes
F
control module activates bar code symbol reading module; resets/starts Timer T_2
5
G
T_2 > T_2 Max ?
Yes
No
H
Does control module receive activation signal A_3 = 1 indicating reading of bar code symbol ?
No
Yes
3

FIG. 9A

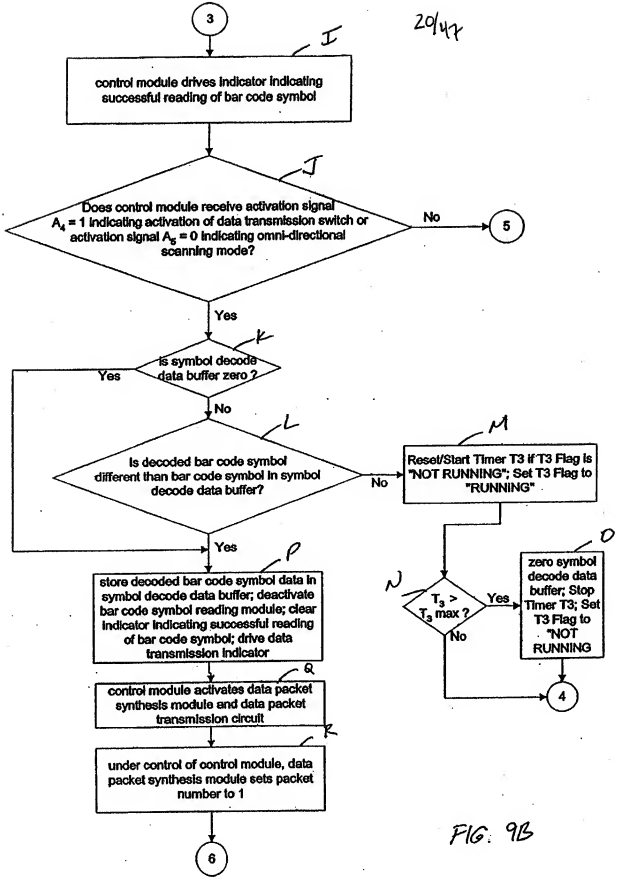

3
I
control module drives indicator indicating successful reading of bar code symbol
J
Does control module receive activation signal A_4 = 1 indicating activation of data transmission switch or activation signal A_5 = 0 indicating omni-directional scanning mode?
No
5
Yes
K
Is symbol decode data buffer zero ?
Yes
No
L
Is decoded bar code symbol different than bar code symbol in symbol decode data buffer?
No
M
Reset/Start Timer T3 if T3 Flag is "NOT RUNNING"; Set T3 Flag to "RUNNING"
Yes
P
store decoded bar code symbol data in symbol decode data buffer; deactivate bar code symbol reading module; clear indicator indicating successful reading of bar code symbol; drive data transmission indicator
N
$T_3 > T_3$ max ?
Yes
No
O
zero symbol decode data buffer; Stop Timer T3; Set T3 Flag to "NOT RUNNING
4
Q
control module activates data packet synthesis module and data packet transmission circuit
R
under control of control module, data packet synthesis module sets packet number to 1
6

FIG. 9B

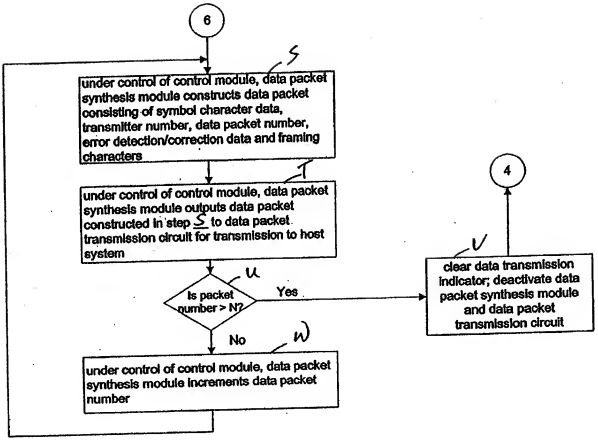

6
S
under control of control module, data packet synthesis module constructs data packet consisting of symbol character data, transmitter number, data packet number, error detection/correction data and framing characters
T
under control of control module, data packet synthesis module outputs data packet constructed in step S to data packet transmission circuit for transmission to host system
U
Is packet number > N?
Yes
No
V
clear data transmission indicator; deactivate data packet synthesis module and data packet transmission circuit
4
W
under control of control module, data packet synthesis module increments data packet number

FIG. 9C

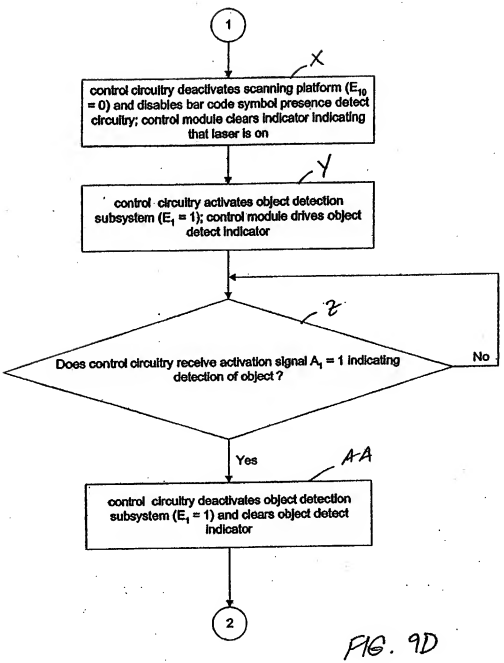

1
X
control circuitry deactivates scanning platform (E_{10} = 0) and disables bar code symbol presence detect circuitry; control module clears indicator indicating that laser is on
Y
control circuitry activates object detection subsystem (E_1 = 1); control module drives object detect indicator
Z
Does control circuitry receive activation signal A_1 = 1 indicating detection of object?
No
Yes
AA
control circuitry deactivates object detection subsystem (E_1 = 1) and clears object detect indicator
2

FIG. 9D

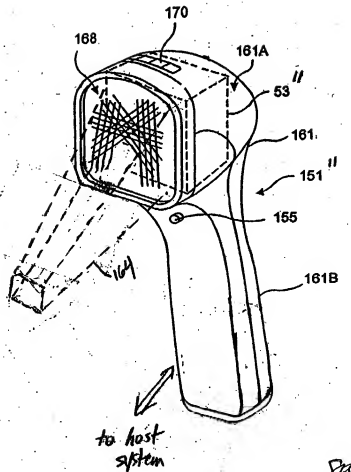


FIG. 10A

Second Generalized Embodiment

10042755.111302

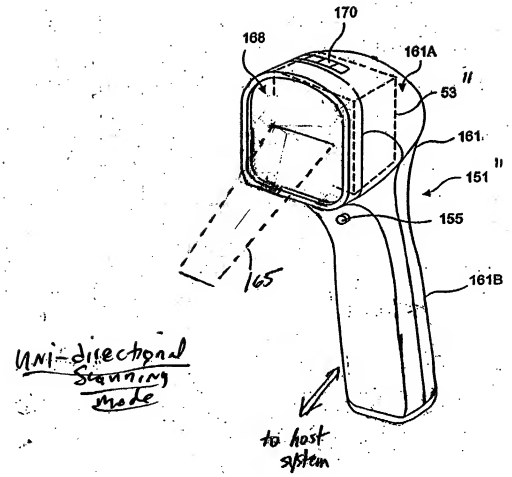


FIG 10B

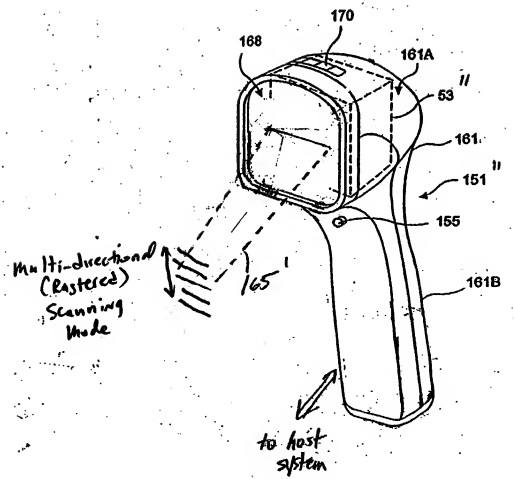

170
168
161A
53
161
151
155
161B
Multi-directional (Rastered) Scanning Mode
165'
to host system

FIG. 10C

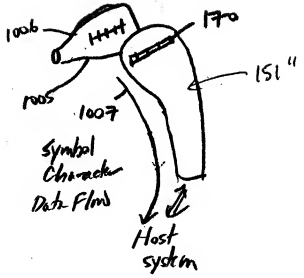

1006
170
151"
1005
1007
Symbol Character Data Flow
Host system

FIG. 11A

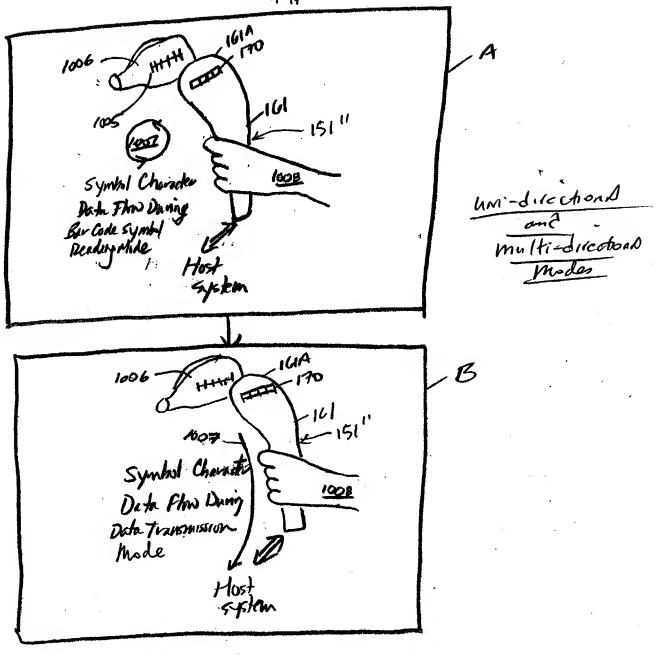

A
1006
161A
170
161
151"
1005
1007
Symbol Character Data Flow During Bar Code Symbol Reading Mode
1008
Host System
uni-directional and multi-directional modes
B
1006
161A
170
161
151"
1007
Symbol Character Data Flow During Data Transmission Mode
1008
Host System

FIG. 11B

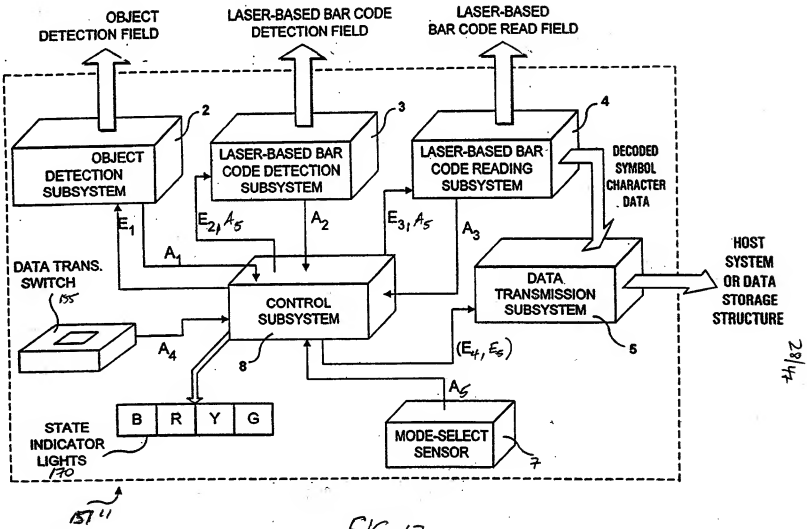


FIG. 12

US 6,244,512 B1

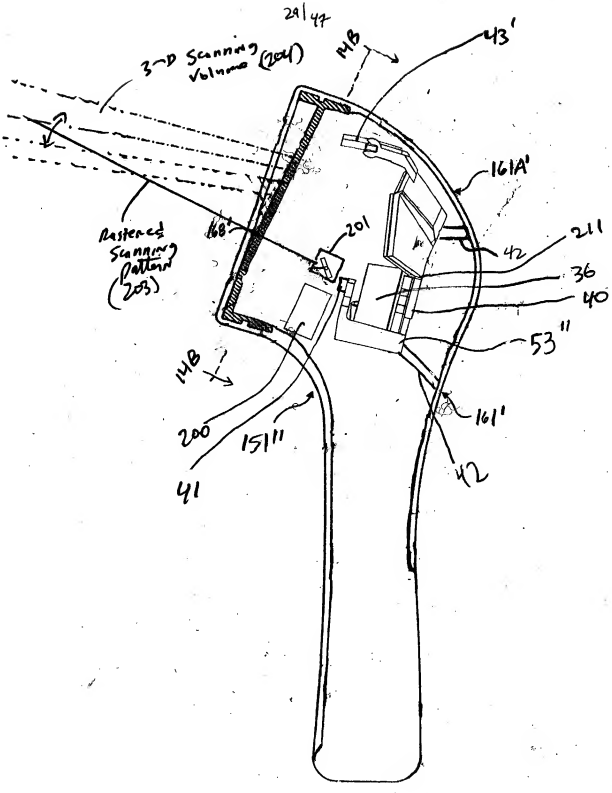

29/47
3-D Scanning Volume (204)
MB
43'
161A'
Rastered Scanning Pattern (203)
68
201
211
42
36
40
53"
MB
200
151"
41
161'
42

FIG. 13

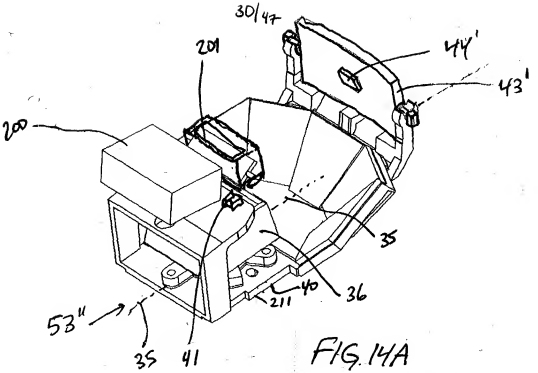


FIG. 14A

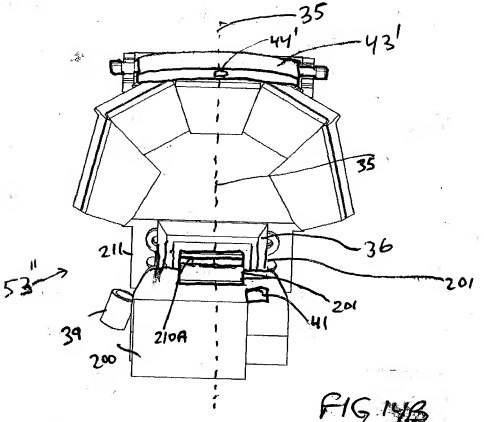


FIG. 14B

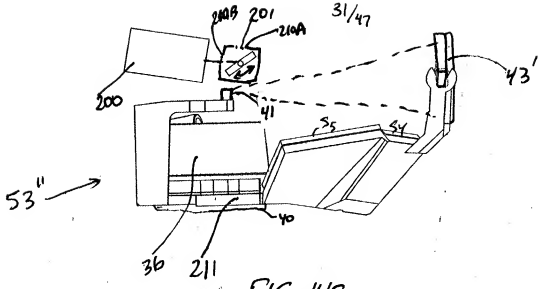


FIG. 14C

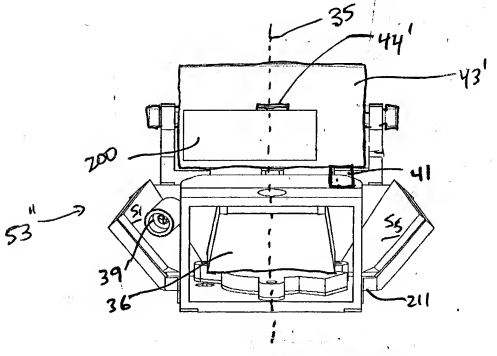


FIG. 14D

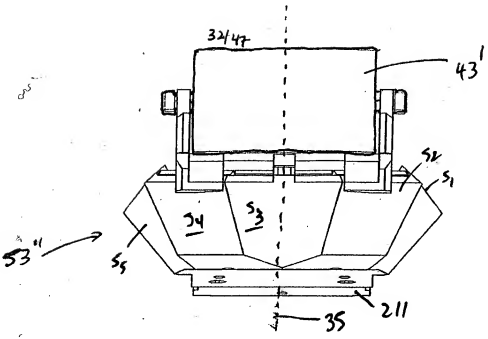


FIG. 14E

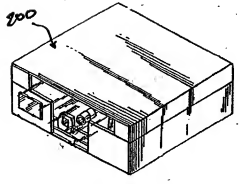


FIG. 14F

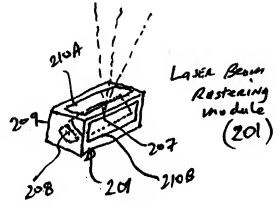


FIG. 14G

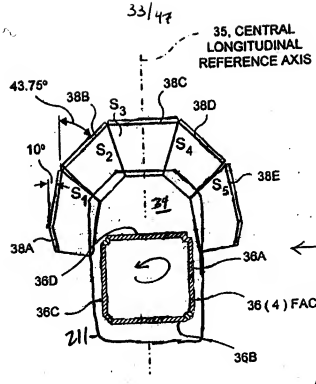


FIG. 15A

Optics Bench Array Mirror
Specifications

Mirror	Relief Angle	Twist Angle
	Degrees	
1	45.91	69.32
2	47.85	34.15
3	48.4	0
4	47.85	34.15
5	45.91	69.32

Mirror	Length	Width
	Millimeters	
1	19.872	17.303
2	16.341	13.746
3	16.67	15.788
4	16.341	13.746
5	19.872	17.303

FIG. 15B

Angles specification:

Definitions:
Relief Angle - The angle between the plane including all the bottom front edges of the array mirrors and the front surface of the mirror being measured.
Twist Angle - The angle of rotation about the z-axis with 0 degrees twist being defined as perpendicular to the incident beam (field 3)

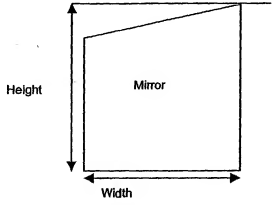


FIG. 15C

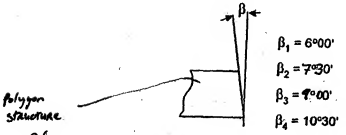


FIG. 15D

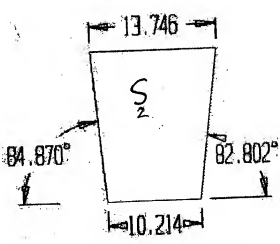


FIG. 15F

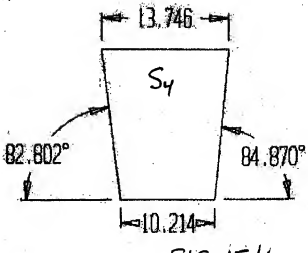


FIG. 15H

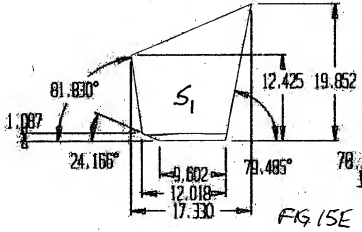


FIG. 15E

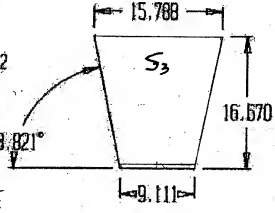


FIG. 15G

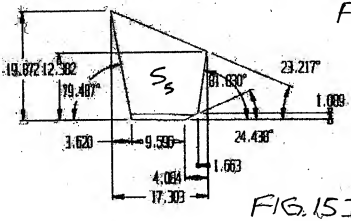


FIG. 15I

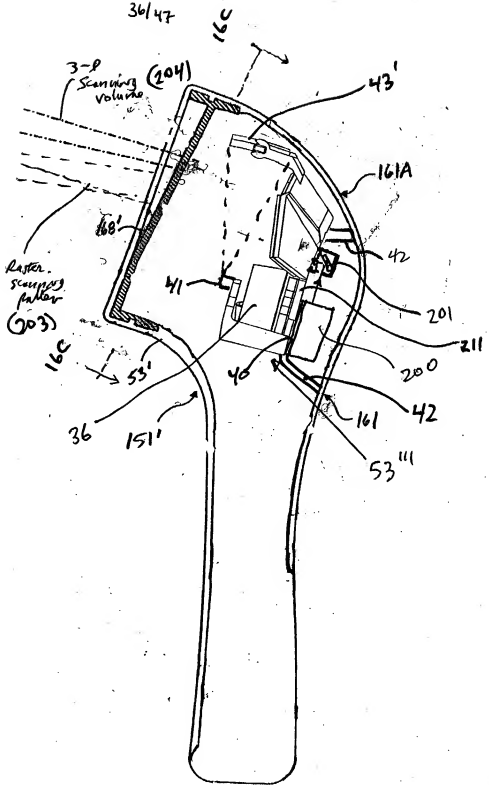

36/47
16C
3-D Scanning Volume (204)
43'
161A
160'
42
41
201
211
Raster scanning pattern (203)
16C
53'
40
200
36
151'
161
42
53'''

FIG. 16A

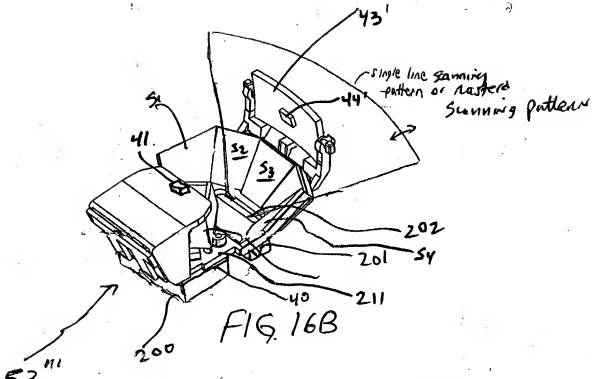


FIG. 16B

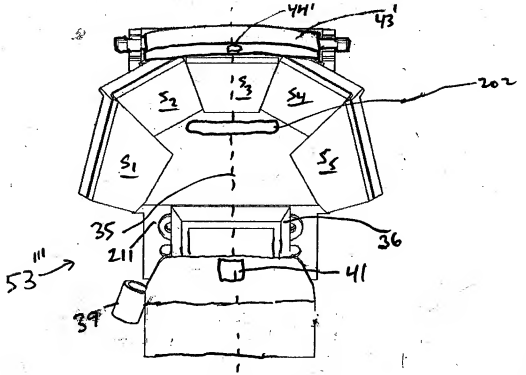


FIG. 16C

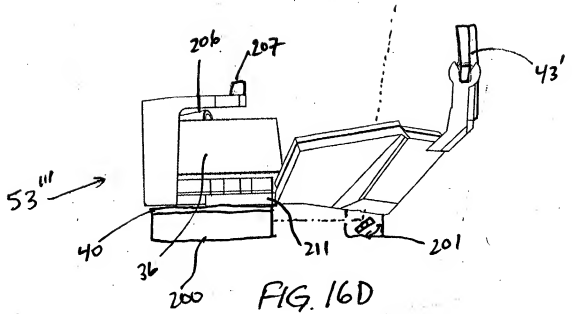


FIG. 16D

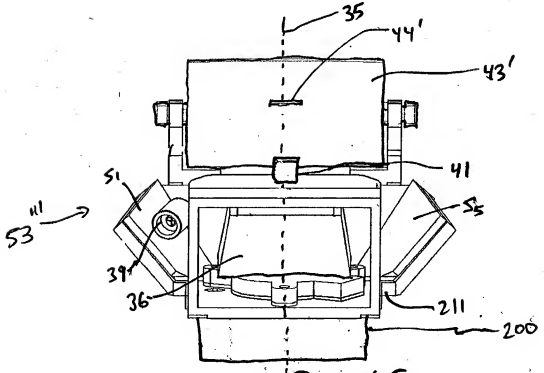


FIG. 16E

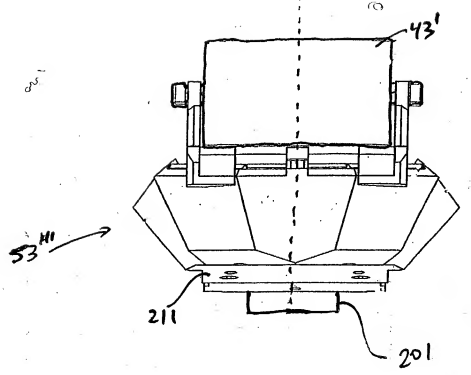


FIG. 16F

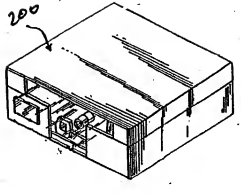


FIG 16G

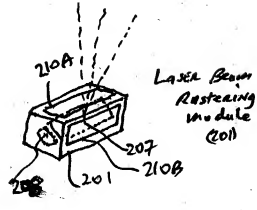


FIG 16H

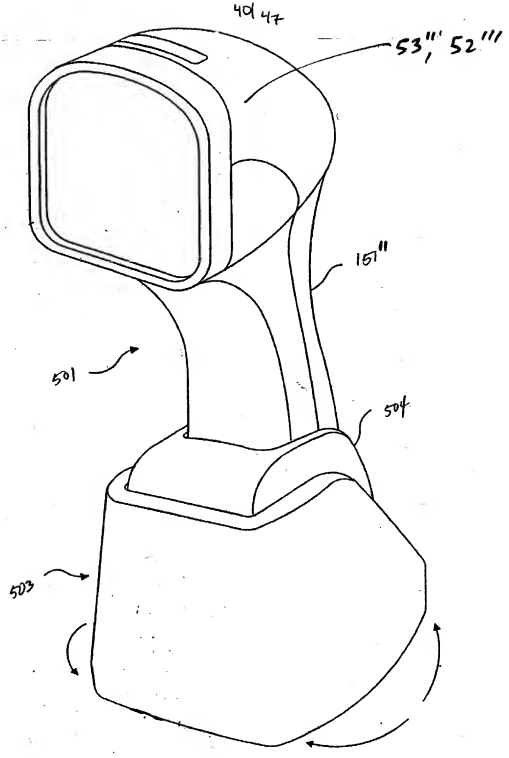
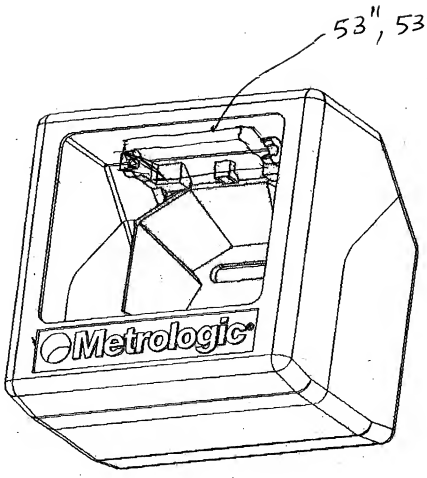


FIG. 17



Device has omni direction, multi-directional and uni-directional scanning modes of operation

FIG. 18

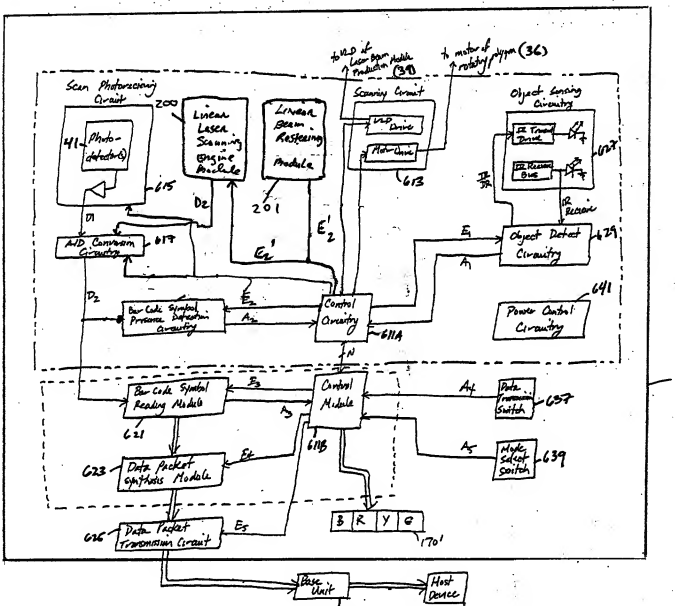

Scan Photosensing Circuit
200
411
Photo-detector(s)
615
Linear Laser Scanning Engine Module
Linear Beam Restoring Module
201
to VLD of Laser Beam Production Module 30
to motor of rotating mirror (36)
Scanning Circuit
VLD Drive
Motor Drive
613
Object Sensing Circuitry
IR Transmit Drive
IR Receive Drive
603
IR Transmit
IR Receive
D1
D2
E'2
E2
E1
A1
A/D Conversion Circuitry
617
Object Detect Circuitry
629
Bar Code Symbol Presence Detection Circuitry
A2
Control Circuitry
611A
641
Power Control Circuitry
N
151
Bar Code Symbol Reading Module
E3
A3
621
Control Module
A4
Data Transmit Switch
637
611B
A5
Mode Select Switch
639
623
Data Packet Synthesis Module
E4
626
Data Packet Transmission Circuit
E5
B
R
Y
G
170
Base Unit
Host Device
503

FIG. 19

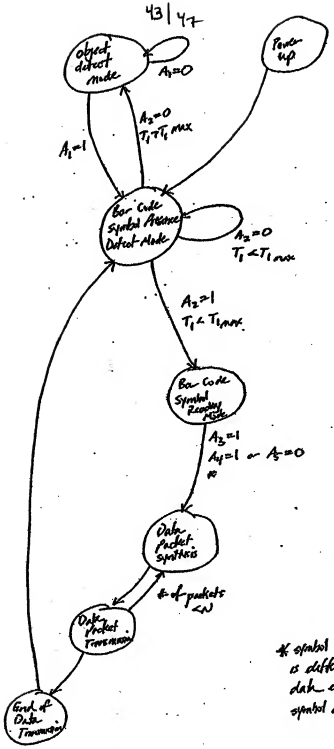

Object detect mode
$A_3=0$
Power up
$A_2=0$
$T_1 \geq T_{1\,max}$
$A_1=1$
Bar code Symbol Absence Detect Mode
$A_2=0$
$T_1 < T_{1\,max}$
$A_2=1$
$T_1 < T_{1\,max}$
Bar code Symbol Reading Mode
$A_2=1$
$A_4=1$ or $A_5=0$
Data Packet Synthesis
# of packets < N
Data Packet Transmission
End of Data Transmission
symbol characters data is different than data element in decoded symbol data buffer

FIG 20

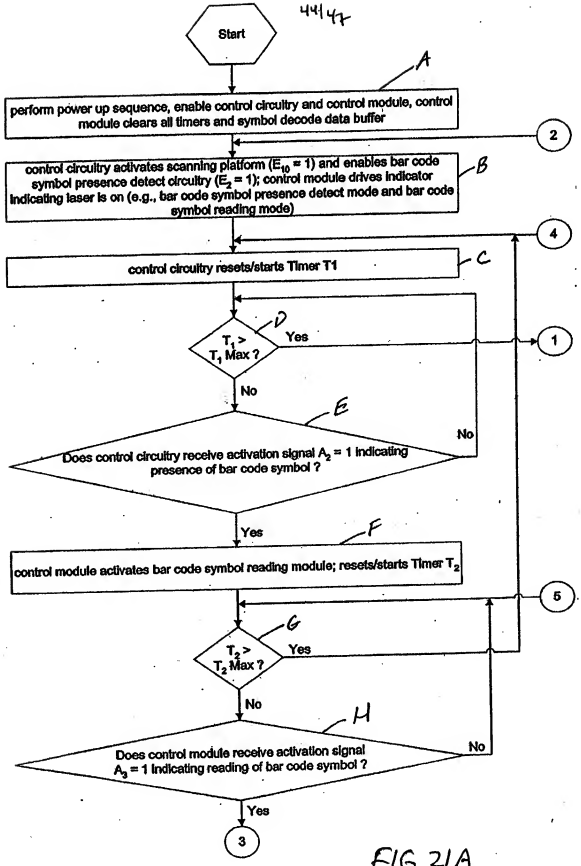

Start
44/47
A
perform power up sequence, enable control circuitry and control module, control module clears all timers and symbol decode data buffer
2
control circuitry activates scanning platform (E_{10} = 1) and enables bar code symbol presence detect circuitry (E_2 = 1); control module drives indicator indicating laser is on (e.g., bar code symbol presence detect mode and bar code symbol reading mode)
B
4
control circuitry resets/starts Timer T1
C
D
T_1 > T_1 Max ?
Yes
1
No
E
Does control circuitry receive activation signal A_2 = 1 indicating presence of bar code symbol ?
No
Yes
F
control module activates bar code symbol reading module; resets/starts Timer T_2
5
G
T_2 > T_2 Max ?
Yes
No
H
Does control module receive activation signal A_3 = 1 indicating reading of bar code symbol ?
No
Yes
3

FIG. 21A

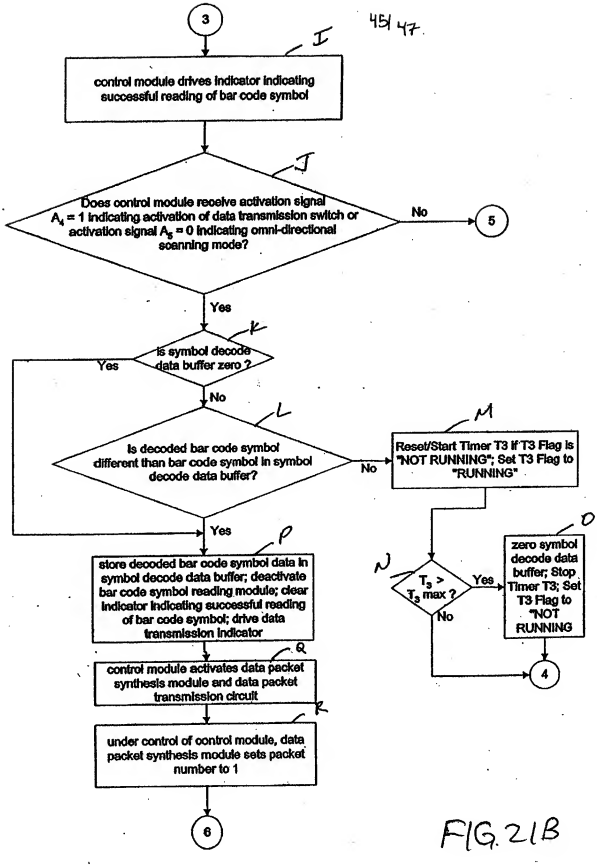

3
I
control module drives indicator indicating successful reading of bar code symbol
J
Does control module receive activation signal A_4 = 1 indicating activation of data transmission switch or activation signal A_5 = 0 indicating omni-directional scanning mode?
No
5
Yes
K
Is symbol decode data buffer zero ?
Yes
No
L
Is decoded bar code symbol different than bar code symbol in symbol decode data buffer?
No
M
Reset/Start Timer T3 if T3 Flag is "NOT RUNNING"; Set T3 Flag to "RUNNING"
Yes
P
store decoded bar code symbol data in symbol decode data buffer; deactivate bar code symbol reading module; clear indicator indicating successful reading of bar code symbol; drive data transmission indicator
N
$T_3 > T_3$ max ?
Yes
No
O
zero symbol decode data buffer; Stop Timer T3; Set T3 Flag to "NOT RUNNING
4
Q
control module activates data packet synthesis module and data packet transmission circuit
R
under control of control module, data packet synthesis module sets packet number to 1
6

FIG.21B

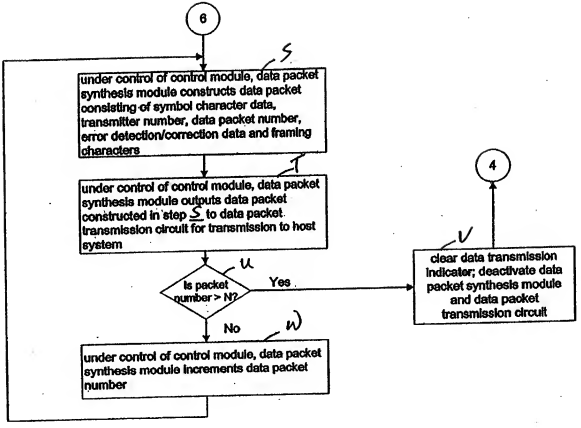

6
S
under control of control module, data packet synthesis module constructs data packet consisting of symbol character data, transmitter number, data packet number, error detection/correction data and framing characters
T
under control of control module, data packet synthesis module outputs data packet constructed in step S to data packet transmission circuit for transmission to host system
U
Is packet number > N?
Yes
No
W
under control of control module, data packet synthesis module increments data packet number
V
clear data transmission indicator; deactivate data packet synthesis module and data packet transmission circuit
4

FIG.21C

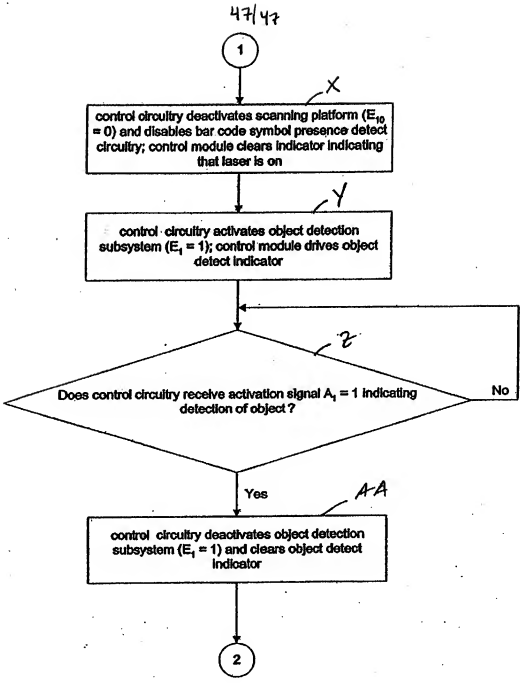

1
X
control circuitry deactivates scanning platform (E_{10} = 0) and disables bar code symbol presence detect circuitry; control module clears indicator indicating that laser is on
Y
control circuitry activates object detection subsystem (E_1 = 1); control module drives object detect indicator
Z
Does control circuitry receive activation signal A_1 = 1 indicating detection of object ?
No
Yes
AA
control circuitry deactivates object detection subsystem (E_1 = 1) and clears object detect indicator
2

FIG. 21D